A new way to transfer energy between cells

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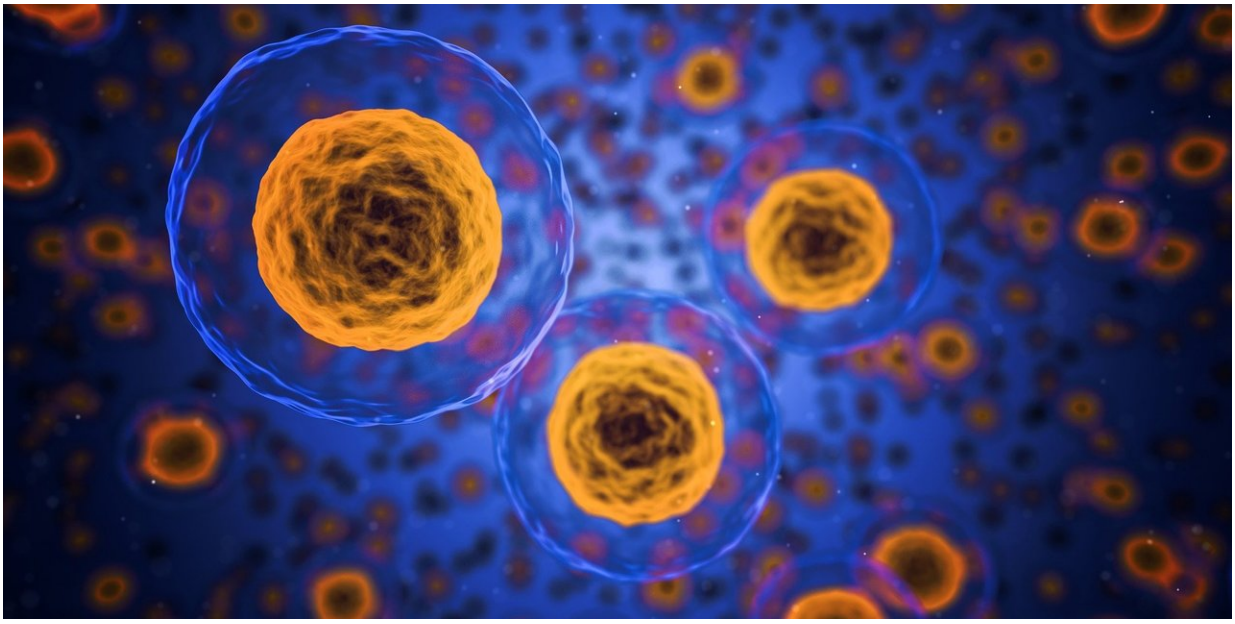

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Researchers from the Catalonian Institute of Bioengineering (Instituto de Bioingeniería de Cataluña) and the Seville Chemical Research Institute (Instituto de Investigaciones Químicas de Sevilla) have described a new method for the transmission of electrons between proteins that refutes the evidence from experiments until now. This process, involved in the generation of energy in both animal and plant cells, will permit better understanding of the behaviour of proteins in the cells, as well as giving a deeper understanding of the energy dysfunctions that cause diseases.

The production of energy inside living cells is fundamental to correct metabolic function. For that reason, specialised organelles exist that are called chloroplasts in plant cells and mitochondria in animal cells. In these, plants transform the energy of the sun into useful chemical energy – in a process known as photosynthesis – and animals combust food with oxygen from the air to use the energy released during breathing.

Both processes involve the transfer of electrons between specialised proteins. For that, it is necessary to have physical contact between them and the consequent formation of a transitory intermediate state to establish the route of transfer. For years, this has been the central dogma in the study of metabolic energy in biology, until the results of a joint project featuring researchers from the Catalonian Institute of Bioengineering, led by the teacher Pau Gorostiza, and the Seville Chemical Research Institute, led by Irene Díaz Moreno and Miguel Ángel de la Rosa. This project has managed to show that proteins in aqueous solution can transfer electrons large distances, without the need for direct contact between them, which contradicts the experimental evidence available until now.

The finding, published in the review *Nature Communications*, makes it possible to explain not only the high speed of transfer of electrons, but also the high rates of replacement and efficiency that exist between proteins in chloroplasts and mitochondria. The discovery allows, also, for a deeper understanding of the mechanisms that govern the production of energy in biology and, as a result, in the molecular bases of the energy dysfunctions that cause diseases.

More information: Anna Lagunas et al. Long distance electron transfer through the aqueous solution between redox partner proteins, *Nature Communications* (2018). DOI: 10.1038/s41467-018-07499-x

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